



The resources you may use include **one magnifying glass**, the **Science Olympiad Official Fossil List** and one **2" or smaller three-ring binder**, as measured by the interior diameter of the rings, containing information in any form and from any source. You are free to communicate with your partner via the chat function on Scilympiad. **DO NOT** consult any other resource!!

IMPORTANT NOTE: If you **cannot see the images**, please skip the question or any other questions related to that image, and let us know in the textbox where you're supposed to write your answer that you were unable to see your answer!!!

IMPORTANT NOTE 2: When asked to identify a specimen, **please identify only to the taxonomic level specified**, and include just the taxon name, e.g. "Mucrospirifer", not "Genus Mucrospirifer"—otherwise **the autograder will mark your answer as wrong**. Also please be mindful of spelling; we will go back and check through all your answers to the best of our ability, but there is a chance that we will miss it and you might not get the credit you deserve.

Good luck and have fun! \(^o^)/

1. (1.00 pts) Identify the genus represented by Specimen A.



2. (1.00 pts) Identify the genus represented by Specimen B.



3. (1.00 pts) Identify the genus represented by Specimen C.



4. (1.00 pts) Identify the genus represented by Specimen D.



5. (2.00 pts) Check the taxonomic groups that **ALL** these specimens fall under.

(Mark **ALL** correct answers)

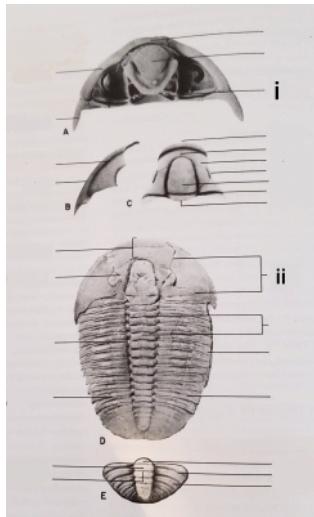
- A) Phylum Arthropoda
- B) Subphylum Crustacea
- C) Subphylum Chelicerata
- D) Class Trilobita
- E) Class Insecta
- F) None of the above

6. (1.00 pts) What type of eyes does Specimen D have?

- A) Holochroal

- B) Schizochroal
- C) Abathochroal
- D) None of the above

Refer to the image below to answer Q7-Q11.



7. (1.00 pts) Which letter illustrates the dorsal view of the cephalon?

- A) A
- B) B
- C) C
- D) D
- E) E

8. (1.00 pts)

The cephalic spines are most commonly located near the posterolateral corners of the cephalon. This is the same location as where another set of "spines" are located. What is the name of this spine?

9. (1.00 pts) One of the specimens displayed in this station possesses very exaggerated versions of the feature from the answer of Q8. Which specimen is it?

- A) Specimen A
- B) Specimen B
- C) Specimen C
- D) Specimen D
- E) None of the above

10. (1.00 pts) What is the name of the internal ridge of the exoskeleton that is labeled i?

11. (2.00 pts) What are **two** uses for the anatomical structure from Q10?

12. (2.00 pts)

Of the specimens in the beginning of the station, which of the following were able to survive in low oxygen environments (lower than what most living creatures could survive)?

(Mark **ALL** correct answers)

- A) Specimen A
- B) Specimen B
- C) Specimen C
- D) Specimen D
- E) None of the above

13. (1.00 pts) Identify the order represented by Specimen E.



14. (2.00 pts) Name the two **shell components** of the specimen you identified in the previous question.

15. (1.00 pts) Specimen E is best described as

- A) anapsid
- B) diapsid
- C) synapsid
- D) euryapsid

16. (1.00 pts) Identify the genus represented by Specimen F.



17. (1.00 pts) Specimen F is best described as

- A) anapsid
- B) diapsid
- C) synapsid
- D) euryapsid

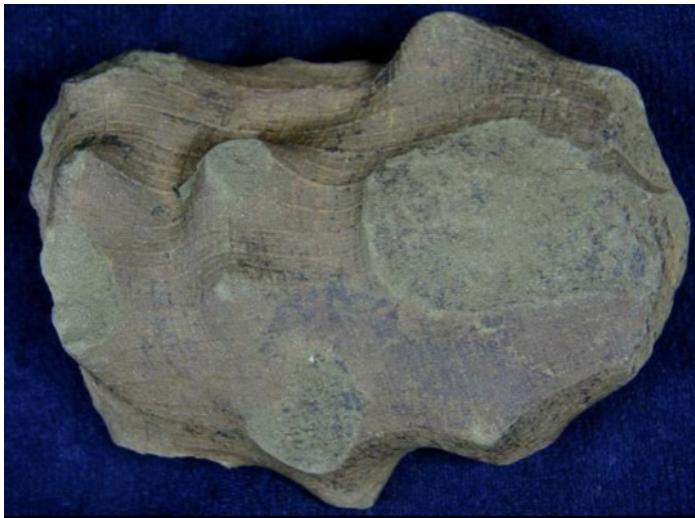
18. (1.00 pts) The terms anapsid, diapsid, synapsid, and euryapsid are in reference to which morphological feature or characteristic of these specimens?

19. (2.00 pts) During which geologic periods would dinosaurs have been able to eat mammals?

(Mark **ALL** correct answers)

- A) Permian
- B) Triassic
- C) Jurassic
- D) Cretaceous
- E) Paleogene
- F) Neogene

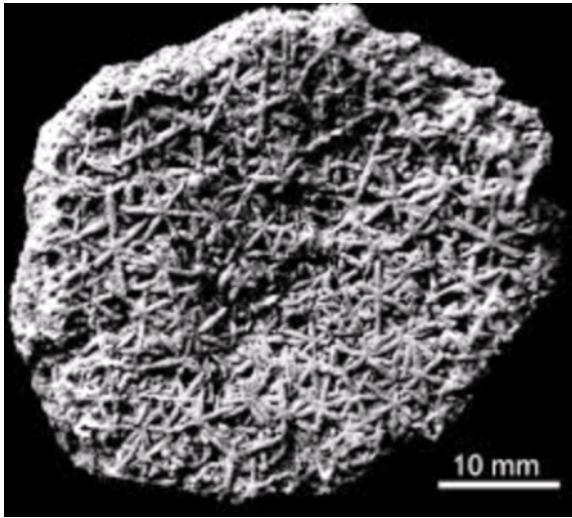
20. (1.00 pts) Identify the genus represented by Specimen G.



21. (1.00 pts) The mineralized skeleton of Specimen G is composed of

- A) calcium carbonate
- B) calcium phosphate
- C) silicate
- D) chitin

22. (1.00 pts) Identify the genus represented by Specimen H.



23. (1.00 pts) The mineralized skeleton of Specimen H is composed of

- A) calcium carbonate
- B) calcium phosphate
- C) silicate

D) chitin

24. (1.00 pts) How many layers of tissue are found in Specimen H?

25. (1.00 pts) Identify the genus represented by Specimen I.



26. (1.00 pts) Provide a temporal range (in geologic periods) for the **order** represented by Specimen I.

_____ period to _____ period (do not include descriptors like 'upper', 'middle', etc.)

27. (1.00 pts) Identify the genus represented by Specimen J.



28. (1.00 pts) Provide a temporal range (in geologic periods) for the **order** represented by Specimen J.

_____ period to _____ period (do not include descriptors like 'upper', 'middle', etc.)

29. (1.00 pts) Identify the genus represented by Specimen K.



30. (1.00 pts) Provide a temporal range (in geologic periods) for the **order** represented by Specimen K.

_____ period to _____ period (do not include descriptors like 'upper', 'middle', etc.)

31. (1.00 pts) Specimen J is best described as

- A) solitary
- B) colonial

32. (1.00 pts) Specimen K is best described as

- A) solitary
- B) colonial

33. (1.00 pts) Which specimen is most closely related to living corals?

- A) Specimen G
- B) Specimen H
- C) Specimen I
- D) Specimen J
- E) Specimen K

34. (2.00 pts) Besides corals, name **two** other groups of organisms that form reefs or have been known to do so in the past

35. (1.00 pts) Identify the genus represented by Specimen L.



36. (2.00 pts) Why do we know so little about the tail end of Specimen L?

(Mark ALL correct answers)

- A) the genus is known only from one incomplete fossil
- B) the tail end was likely made of cartilage, which does not fossilize easily
- C) only the head and frontal sections were covered in armor
- D) the tail end was composed of smaller bones that get disarticulated easily
- E) trick question—we do have a good idea what the tail end looked like!

37. (1.00 pts) Identify the genus represented by Specimen M.



38. (1.00 pts) What kinds of environments would Specimen M have been able to tolerate?

- A) freshwater, only

- B) saltwater, only
- C) both freshwater and saltwater
- D) terrestrial

39. (1.00 pts) Identify the genus represented by Specimen N.



40. (1.00 pts) Identify the genus represented by Specimen O.



41. (2.00 pts) Give **two** reasons why teeth are the most common kind of shark fossil found (compared to body fossils).

42. (1.00 pts) Identify the genus represented by Specimen P.



43. (1.00 pts) Identify the genus represented by Specimen Q.



44. (1.00 pts) Identify the genus represented by Specimen R.



45. (1.00 pts) Order Specimens P, Q, and R in terms of appearance in the fossil record.

oldest → youngest

- A) P → Q → R
- B) P → R → Q
- C) Q → P → R
- D) Q → R → P

- E) $R \rightarrow P \rightarrow Q$
- F) $R \rightarrow Q \rightarrow P$

46. (1.00 pts) What kind(s) of respiratory organs did Specimen Q most likely possess?

- A) lungs, only
- B) gills, only
- C) both lungs and gills
- D) neither lungs nor gills—gas exchange occurred across the skin

47. (1.00 pts) Identify the order represented by Specimen S.



48. (1.00 pts) The wire curling along the spiral of the specimen you identified in the previous question is located where the _____ would be.

49. (1.00 pts) Identify the order represented by Specimen T.



50. (1.00 pts) Identify the order represented by Specimen U.



51. (1.00 pts) Identify the order represented by Specimen V.



52. (1.00 pts) What is meant by the term **heteromorph** as it applies to Specimens S-V?

(Mark ALL correct answers)

- A) having an appearance vastly different from closely related taxa
- B) not being tightly coiled or being irregularly coiled
- C) having multiple intraspecific shell forms
- D) occurring in different localities than than the type specimen
- E) different stages of the life cycle that were thought to be entirely different species

53. (3.00 pts) What are true statements regarding the differences/similarities between Specimen S and Specimen V?

(Mark ALL correct answers)

- A) Specimen V has more complex septa
- B) The wire from Q48 on Specimen V is also located medially
- C) Specimen S are still alive today
- D) Specimen S lived shorter lifespans compared to Specimen V

- E) Specimen V died out during the K-T Extinction
- F) Both are divided into chambers that help with buoyancy

54. (1.00 pts) Identify the genus represented by Specimen X.



55. (1.00 pts) Identify the genus represented by Specimen Y.



56. (1.00 pts) Identify the genus represented by Specimen Z.



57. (1.00 pts) Identify the genus represented by Specimen AA



58. (1.00 pts) Specimen AA is best described as _____, and most species are _____.

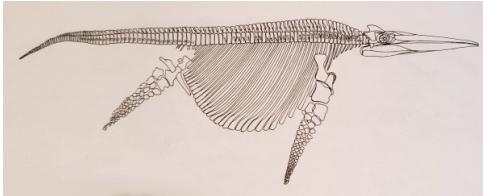
- A) sinistral, sinistral
- B) sinistral, dextral
- C) dextral, sinistral
- D) dextral, dextral

59. (1.00 pts) Are Specimens X, Y, Z, and AA all in the same class? If yes, name the class. If not, identify the **letter** of the odd one out.

60. (2.00 pts) What is responsible for creating the hole in the specimen below? be specific!



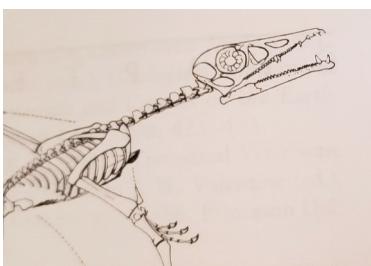
61. (1.00 pts) Identify the order represented by Specimen BB.



62. (1.00 pts) Identify the order represented by Specimen CC.



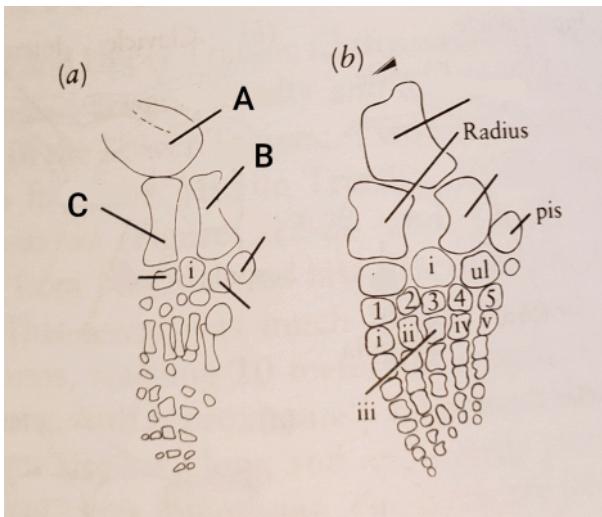
63. (1.00 pts) Identify the order represented by Specimen DD.



64. (1.00 pts) Identify the order represented by Specimen EE



Refer to the diagram below to answer Q65-Q69.



65. (1.00 pts)

Referring to the partially labeled example on the left labeled (b), you can conclude (based on your knowledge on anatomy) the names of the bones that compose this limb. What is the bone labeled A?

66. (1.00 pts)

Referring to the partially labeled example on the left labeled (b), you can conclude (based on your knowledge on anatomy) the names of the bones that compose this limb. What is the bone labeled B?

67. (1.00 pts)

Referring to the partially labeled example on the left labeled (b), you can conclude (based on your knowledge on anatomy) the names of the bones that compose this limb. What is the bone labeled C?



68. (1.00 pts) Which specimen does this diagram represent?

- A) BB
- B) CC
- C) DD
- D) EE
- E) None of the above

69. (2.00 pts) Which of the following are true regarding the order represented by Specimen EE?

(Mark ALL correct answers)

- A) They died out during the K-T Extinction
- B) It has is a synapsid
- C) Its most likely ancestor is the nothosaurs
- D) There are approximately 190 genera in this order
- E) It moved through the water primarily with its tail
- F) The order consists of two main morphological types, based on the size of the head and the length of the neck

70. (1.00 pts) The order represented by Specimen EE has historically been a wastebasket taxon. What does this mean?

- A) Its classification is unofficial
- B) The requirements of which they are classified keep changing
- C) Its purpose is to classify those that do not fit in other classifications
- D) It includes a broader range of organisms
- E) None of the above

71. (1.00 pts) What type of skull does Specimen BB have?

- A) Anapsid
- B) Synapsid
- C) Diapsid
- D) Euryapsid
- E) It does not have a skull

72. (2.00 pts) What time periods did Specimen DD exist?

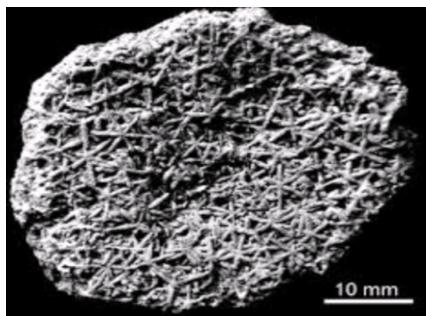
(Mark ALL correct answers)

- A) Permian
- B) Triassic
- C) Jurassic
- D) Cretaceous
- E) Paleogene
- F) Neogene

73. (1.00 pts) Which digit in Specimen DD extended into the wings?

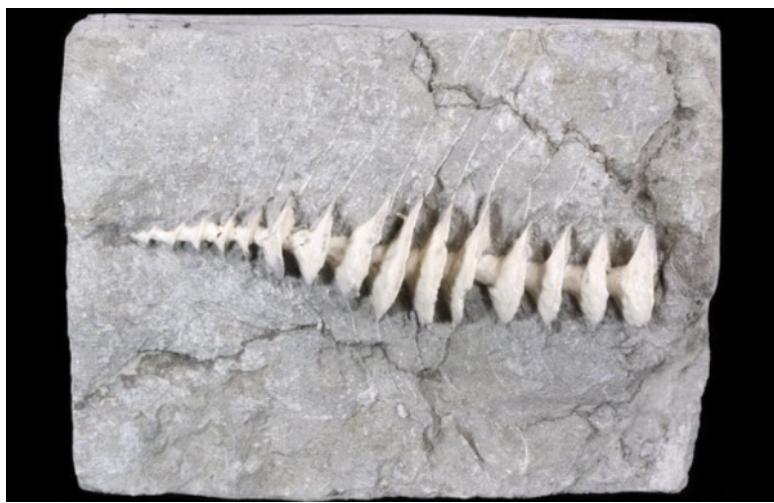
- A) 1
- B) 2
- C) 3
- D) 4
- E) 5
- F) None of the above

74. (1.00 pts) Identify the Order represented by Specimen FF. (HINT: this is an eye)



75. (1.00 pts) What is the ring in the eye from the previous question called?

76. (1.00 pts) Identify the genus represented by Specimen GG.



77. (1.00 pts) What **growth form** is represented by Specimen GG?

(Mark **ALL** correct answers)

- A) branching
- B) massive
- C) fenestrate
- D) None of the above

78. (1.00 pts) Identify the genus represented by Specimen HH.



79. (1.00 pts) A living individual of Specimen HH is called a(n)

- A) zooecium
- B) zooarium
- C) zooid

80. (1.00 pts) The skeleton of an individual of Specimen HH is called a(n)

- A) zooecium
- B) zooarium
- C) zooid

81. (1.00 pts) The skeleton of a colony of Specimen HH is called a(n)

- A) zooecium
- B) zooarium
- C) zooid

82. (1.00 pts) Identify the genus represented by Specimen JJ.



83. (1.00 pts) Identify the genus represented by Specimen KK.



84. (1.00 pts) Identify the genus represented by Specimen LL.



85. (1.00 pts) Identify the genus represented by Specimen MM.



86. (1.00 pts) Identify the genus represented by Specimen NN.



87. (2.00 pts) Which specimens at this station are **brachiopods**?

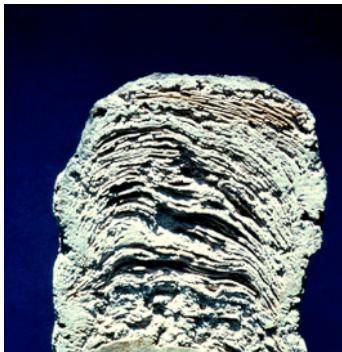
(Mark ALL correct answers)

- A) Specimen JJ
- B) Specimen KK
- C) Specimen LL
- D) Specimen MM
- E) Specimen NN

88. (1.00 pts) Between brachiopods and bivalves, which group has higher metabolism?

- A) brachiopods
- B) bivalves

89. (1.00 pts) What is the structure depicted in Specimen OO called?



90. (1.00 pts) What kind of organisms form the structure you identified in the previous question?

- A) fungi
- B) terrestrial vertebrates
- C) foraminifera
- D) cyanobacteria
- E) bryozoans
- F) the structure is not biological in origin

91. (1.00 pts)

These structures are relatively abundant in very old rock layers, but are much less common in layers from the last 500 million years. What might account for this trend?

- A) animal grazing prevents them from forming in great abundance
- B) these structures only form in anoxic (low-oxygen) environments
- C) erosion and tectonic activity had much less of a presence back then
- D) the organisms that formed these structures went extinct around 500 million years ago
- E) these structures only form during Snowball Earth conditions

92. (1.00 pts) Identify the order represented by Specimen PP.



93. (1.00 pts) Which of the following best describes the life habit of Specimen PP?

- A) benthic
- B) pelagic and planktonic
- C) pelagic and nektonic

94. (1.00 pts) Identify the order represented by Specimen QQ.



95. (1.00 pts) Which of the following best describes the life habit of Specimen QQ?

- A) benthic
- B) pelagic and planktonic
- C) pelagic and nektonic

96. (1.00 pts) What are the functions of **pseudopodia** in Specimen PP?

(Mark ALL correct answers)

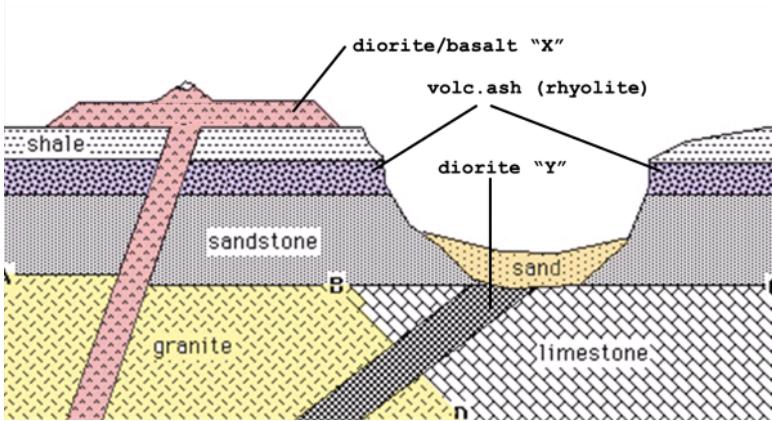
- A) feeding
- B) reproduction
- C) locomotion
- D) defense

97. (1.00 pts) Specimen QQ is an excellent index fossil. What are some of the characteristics of a good index fossil?

(Mark ALL correct answers)

- A) narrow temporal range
- B) narrow geographical range
- C) wide temporal range
- D) wide geographical range
- E) easily identifiable
- F) preserved hard parts

98. (1.00 pts) Which rock in the stratigraphic diagram below is **oldest**?



- A) diorite/basalt "X"
- B) diorite "Y"
- C) granite
- D) limestone
- E) sandstone
- F) shale

99. (1.00 pts) Which rock in the stratigraphic diagram above is **youngest**?

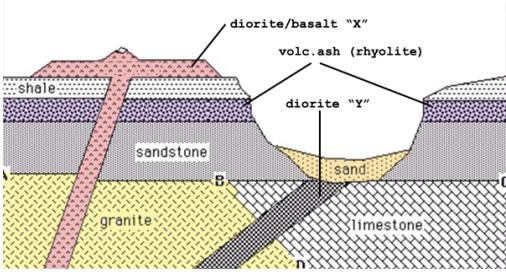
- A) diorite/basalt "X"
- B) diorite "Y"
- C) granite
- D) limestone
- E) sandstone
- F) shale

100. (1.00 pts) Which of Steno's 4 principles did you use to answer questions 99 and 100?

(Mark ALL correct answers)

- A) superposition
- B) original horizontality
- C) lateral continuity
- D) cross-cutting

101. (2.00 pts) Which rock(s) in the stratigraphic diagram below are **sedimentary**?



(Mark ALL correct answers)

- A) diorite/basalt "X"
- B) diorite/basalt "Y"
- C) granite
- D) limestone
- E) sandstone
- F) shale

102. (1.00 pts)

Suppose the volcanic ash (rhyolite) layer in the stratigraphic diagram above was determined to be 12 million years old, and the limestone layer contains a gastropod fossil that is found in strata that are between 17 and 9 million years old. What can you say about the age of the sandstone layer?

- A) younger than 9 million years
- B) younger than 12 million years
- C) between 9 and 12 million years old
- D) between 9 and 17 million years old
- E) between 12 and 17 million years old
- F) older than 17 million years

103. (2.00 pts)

Carbon-14 has a half-life of 5,730 years. Suppose you find a shell that has 6.25% of its initial amount of C-14. How old can you say the shell is? Provide your answer with four significant figures.

104. (1.00 pts) Fossils are only found in sedimentary rocks, never igneous or metamorphic.

- True False

105. (1.00 pts) Identify the genus represented by Specimen RR.



106. (1.00 pts) Identify the genus represented by Specimen SS.



107. (1.00 pts) Identify the genus represented by Specimen TT.



108. (1.00 pts) Identify the genus represented by Specimen UU.



109. (1.00 pts) Which specimen was the first to be officially described?

- A) Specimen RR
- B) Specimen SS
- C) Specimen TT
- D) Specimen UU

110. (3.00 pts) Name the three bones that make up the hip in all four of the above specimens.

111. (1.00 pts) Objects like this one below are often found in tandem with certain dinosaur fossils.

What are these objects called?



112. (1.00 pts) What was the function of the structure you identified in the previous question?

113. (1.00 pts) When did the last dinosaurs go extinct?

114. (1.00 pts) Specimen WW (below) is a very famous fossil known as the London Specimen.

Identify the genus represented by Specimen WW.



115. (1.00 pts) The most complete existing specimen of the genus you identified above (and also the most iconic) is better known as the _____ specimen.

116. (1.00 pts) In total, how many **body fossil** specimens of the genus you identified above have been discovered?

117. (1.00 pts) Specimens in this genus are most closely associated with which lagerstätten?

- A) Mazon Creek
- B) Ghost Ranch
- C) Solnhofen Limestone
- D) Yixian Formation
- E) Green River Formation
- F) Burgess Shale

118. (1.00 pts) What kind of lagerstätten is the one you identified in the previous question?

- A) a concentration lagerstätten
- B) a conservation lagerstätten

119. (2.00 pts) Specimen WW is part of a broader trend in our understanding of the origin of birds.

Which of the following characteristics of Specimen WW are **not** present in modern birds? (choose all that apply)

(Mark **ALL** correct answers)

- A) claws
- B) feathers
- C) wings
- D) teeth
- E) long tail

120. (2.00 pts)

We now know that feathers were present on many groups that weren't capable of powered flight or even gliding. Name two alternative functions of feathers (besides flight or gliding) that may explain this pattern.

121. (1.00 pts) Preserved feathers are perhaps best known from which lagerstätten (excluding the one you identified in Q114)?

- A) Mazon Creek

- B) Ghost Ranch
- C) Solnhofen Limestone
- D) Yixian Formation
- E) Green River Formation
- F) Burgess Shale

122. (1.00 pts) Identify the class represented by Specimen XX.



123. (1.00 pts) Identify the class represented by Specimen YY.



124. (1.00 pts) Identify the class represented by Specimen ZZ.



125. (1.00 pts) Specimen ZZ is best described as

- A) irregular
- B) semiregular
- C) regular
- D) none of the above can be used to describe this specimen

126. (1.00 pts) Identify the class represented by Specimen AAA.



Refer to the diagram below to answer Q127-131.



127. (1.00 pts) Identify the class represented by the diagram.

128. (1.00 pts) What kind of glands does A point to?

129. (1.00 pts) What anatomical part does B point to?

130. (2.00 pts) C points to a feature specific to this phylum. Name this feature.

131. (3.00 pts) Check all the following statements that are true about the structure you identified in the previous question.

(Mark ALL correct answers)

- A) It is a perforated plate
- B) It is a part of the digestive system
- C) It is mostly composed of calcium carbonate
- D) It filters water into the specimen
- E) It is a single opening
- F) It is a type of gland

132. (1.00 pts) All the specimens in this station fall under the same phylum. What is this phylum?

- A) Cnidaria
- B) Hemichordata
- C) Mollusca
- D) Brachiopoda
- E) Echinodermata
- F) none of the above

133. (2.00 pts) Which of the following are true regarding this phylum?

(Mark ALL correct answers)

- A) Adults have radial symmetry
- B) This phylum first arose during the Silurian period
- C) An embryo is bilaterally symmetrical
- D) Asteroidea is the most diverse class
- E) All classes under this phylum are protosomes

134. (2.00 pts) What are two types of cups that can be found in the same class as Specimen AAA?

135. (1.00 pts) Reproduction among creatures in the same class as Specimen AAA are usually asexual.

- True
- False

136. (1.00 pts) What body part on Specimen AAA is used as legs for locomotion?

137. (1.00 pts) Specimen AAA is the state fossil of what state? (Type out full name of state; no abbreviations)